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Forest Pest Management
Pacific Northwest Region

FOREST PEST SURVEY OF STANDS

ALONG THE CHIWAWA RIVER CORRIDOR

LAKE WENATCHEE RANGER DISTRICT

WENATCHEE NATIONAL FOREST

WASHINGTON

3400
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FOREST PEST SURVEY OF STANDS ALONG THE CHIWAWA RIVER CORRIDOR, LAKE WENATCHEE RANGER DISTRICT, WENATCHEE NATIONAL FOREST, WASHINGTON

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Appreciation is extended to Al Kanaskie and Pat Cagney for technical assistance.

ABSTRACT

Nine stands covering 973 acres were surveyed for major diseases and insect damage. Major pests included laminated root rot in grand fir and Douglas-fir, Armillaria root rot and bark beetles in ponderosa pine, dwarf mistletoe in Douglas-fir, blister rust in white pine, Indian paint fungus in grand fir, and mountain pine beetles in white and lodgepole pine. Pest management alternatives are discussed for each stand.

INTRODUCTION

On April 15, 1981 four of nine stands within a visual corridor adjacent to the Chiwawa River, Lake Wenatchee RD (Fig. 1 and 2) were examined for diseases and insect damage (see Biological Evaluation, July 30, 1981). Because of the serious infestations of dwarf mistletoe, root diseases, blister rust, and insects, and because of the aesthetic value of the area, it was recommended that all nine stands be surveyed systematically by Forest Pest Management personnel to determine incidence of pests.

OBJECTIVES

Objectives of our evaluation were to:

1. Determine incidence (percent trees per acre, basal area per acre, and volume per acre) of major diseases and insect-caused mortality in nine stands within the Chiwawa River Corridor.

2. Formulate pest management alternatives for each stand from the collected data.

METHODS

On August 18-21 and October 21-27, 1981, each stand was surveyed using fixed-radius (1/100 acre) and variable (20 or 40 BAF) plots located at 2-chain intervals along transects 10 chains apart. Resource aerial photographs supplied by the District were used to delineate stand boundaries and determine acreages. Only trees with DBH greater than or equal to 5.0 inches were included in the variable plots. Trees less than 5.0 inches DBH but greater than or equal to 6 inches in height were included in fixed-radius plots.

Data were collected for all trees on every fifth plot except for Stands 149 and 151 where all trees were measured on all plots. On all other plots data were recorded only for dead or dying trees or living trees with disease signs or symptoms.

The following data were collected for each plot tree (1) species, (2) DBH, (3) condition (healthy, live infected, recent kill, snag, stub, or down dead), and (4) cause of disease or mortality. In addition, except for stands 149 and 151, for each living tree on every fifth plot, we measured total defect, crown ratio, crown class, age group, DBH increment, and total height. This information will be used by the District for calculating additional stand information.

Root diseases were visually detected following partial excavation and dissection of roots and root collars. Only dead or highly symptomatic (thin crowns, spike tops, basal resinosis) trees were examined. No attempt was made to detect root diseases in living trees without above-ground symptoms. Laminated root rot was detected by the presence of white ectotrophic mycelium on excavated roots or laminated decay with setal hyphae (Fig. 3). Annosus root rot was identified by its characteristic white, stringy rot. Armillaria root rot was detected by the presence of characteristic mycelial fans beneath the bark at the root collar (Fig. 4) or by yellow, stringy, decayed wood.

The presence of witches'-brooms and/or branch swellings in the crown indicated dwarf mistletoe. White pine blister rust and western gall rust were identified by their characteristic cankers and swellings on white pine and lodgepole pine, respectively. Damage caused by bark beetles was identified by removing sections of bark at DBH and observing gallery patterns on dead or dying trees. Dead trees (standing or down) with intact bark on less than half of their circumference at the root collar were considered to have been dead for more than 20 years and were not measured, since such trees are often too deteriorated to identify causal agents.

Cubic and board foot (Scribner) volumes were calculated from diameters and heights collected from sample trees representing all diameter classes within a species. Data were pooled for all units and volumes computed using an FPM computer program. Form classes were obtained from District records. Cubic foot volumes were calculated to a top diameter of 4.0 inches on all trees 6.0 inches DBH or greater. Board foot volumes were calculated to an 8.0 inch top diameter on all trees 10.0 inches DBH or greater.

RESULTS AND DISCUSSION

Nine stands covering 973 acres were surveyed using 458 plots (0.5 plot/acre). The following is a description of each stand with suggested management recommendations to reduce present and future pest damage:

STAND 122

Stand 122 is 190 acres with a southwest aspect and fairly steep slopes. Fifty-five plots, 15 from which all data were collected, were used in the survey. The stand is composed primarily of Douglas-fir (*Pseudotsuga menziesii*), ponderosa pine (*Pinus ponderosa*), and some grand fir (*Abies grandis*) in the overstory (Tables 1A, 1B, 1C, and 1D). The understory is primarily Douglas-fir and grand fir. No recent harvesting is evident in the stand.

Nearly 30% of the trees per acre ($\geq$ 5 in. DBH) representing 12% of the board-foot volume per acre are dead.

Laminated root rot, caused by *Phellinus weirii*, is the most damaging pest in this stand. Almost a third of the grand fir has been killed by this pathogen, often in association with fir engravers (*Scolytus ventralis*). Douglas-fir also is being killed by *P. weirii* and Armillaria root rot caused by *Armillaria mellea*. Ponderosa pine mortality is attributed to *A. mellea* and bark beetles, mostly mountain pine beetles (*Dendroctonus ponderosae*). Most mortality in ponderosa pine involves apparently weakened trees. Stress often predisposes pines to Armillaria root rot and mountain pine beetles. Some dwarf mistletoe (*Arceuthobium douglassii*) is present in the Douglas-fir. However, all infected plot trees are alive and most are only lightly infected.

Most of the agents causing the mortality listed as "misc. dead" could not be identified because these trees often were badly deteriorated. However, there is considerable top-break and windthrow which appears to be caused by heavy snow or ice loads, especially in the southwest part of the stand. All of the mortality listed under "other species" occurs in lodgepole pine (*P. contorta*) and is caused by mountain pine beetles alone or in association with Armillaria root rot.

SPECIFIC RECOMMENDATIONS - STAND 122

(1) Increase the component of ponderosa, lodgepole and/or white pine. These species are less susceptible to mortality caused by laminated root rot[1/] and are immune to Douglas-fir dwarf mistletoe. By maintaining good pine vigor through basal area control (reduced to 60 percent of normal[2/]), mortality caused by mountain pine beetle and Armillaria root rot should be minimized.

If white pine is to be planted, blister rust-resistant stock should be used.

1/ Hadfield, J.S. and D. W. Johnson. 1977. Laminated root rot - a guide for reducing and preventing losses in Oregon and Washington forests. Forest Pest Management, Pacific Northwest Region, USDA Forest Service, Portland, OR, 16 p.

2/ Dolph, R. E., Jr. Mountain pine beetle damage in the Pacific Northwest 1955-1956. Insect and Disease Control Branch, Division of Timber Management, Pacific Northwest Region, USDA Forest Service, Portland, OR, 36 p.

(2) If clearcutting, remove or destroy all cull and unmerchantable Douglas-fir and grand fir. Plant only pine and avoid offsite stock. Remove all fir from unit margins to minimize natural seeding within the unit.

(3) If partial cutting using a seed tree or shelterwood system, retain only pine in the overstory to serve as seed trees and in the understory to serve as potential crop trees.

Although it is unlikely that reestablishment of grand fir or Douglas-fir within the unit can be prevented, a higher proportion of pine than presently exists will reduce incidence of root disease by limiting root-to-root disease spread.

STAND 121

Stand 121 is 100 acres and adjacent to Stand 122, with similar slope and aspect. Fifty plots, 11 from which all data were collected, were used in the survey. Species composition is similar to Stand 122, except for the presence of some western redcedar (*Thuja plicata*) in both of the overstory and understory (Tables 2A, 2B, 2C, and 2D). No recent harvesting is evident in the stand.

Almost 27% of the trees per acre ($\geq$5 in. DBH) representing 11% of the board-foot volume per acre are dead.

As in Stand 122, laminated root rot is the most damaging pest. Mortality caused by Armillaria root rot is also evident, especially in smaller-diameter ponderosa pine. Some light to moderate infections of Douglas-fir dwarf mistletoe are present. All of the cedar appears to be healthy.

SPECIFIC RECOMMENDATIONS - STAND 121

Treat this stand in the same fashion as Stand 122. Since cedar is resistant to laminated root rot, it should be retained wherever possible.

STAND 118

Stand 118 is 150 acres and is located in a flood plain along the Chiwawa River. Seventy-six plots, of which 16 were total data plots, were examined. The stand is composed of small-diameter grand fir and Engelmann spruce (*Picea engelmannii*) and large-diameter Douglas-fir, ponderosa pine, and western redcedar (Tables 3A, 3B, 3C, and 3D). Some lodgepole pine, white pine, Pacific silver fir (*A. amabilis*), western hemlock (*Tsuga heterophylla*), and black cottonwood (*Populus trichocarpa*) also are present. Regeneration is composed primarily of grand fir, cedar, and white pine. The stand was partially harvested within the last 10 years.

Only 4% of the trees per acre ($\geq$5 in. DBH) representing 3% of the board-foot volume per acre are dead.

No major diseases or insect damage occur in Douglas-fir, ponderosa pine, Engelmann spruce, or minor tree species (Tables 3A, 3B, 3C, 3D).

The most conspicuous disease in the stand is rust-red, stringy rot caused by the Indian paint fungus (*Echinodontium tinctorium*) in grand fir. This is a common problem of true firs and hemlocks that have been suppressed for 50 or more years and that have been wounded subsequently. The fungus forms characteristic conks only after considerable heart rot has occurred, usually in older trees.

Grand firs categorized as "misc. dead" were generally too deteriorated to determine the causal agent or were affected by Armillaria root rot, laminated root rot, or fir engravers.

Lodgepole pine is being killed by mountain pine beetles in this stand. Low vigor pines are highly susceptible to attack by mountain pine beetles. Recent research shows that tree vigor can be expressed as the amount of wood produced in grams per square meter of foliage. Trees producing less than 50 grams are classified as low vigor; between 50 and 100 grams, moderate vigor; and more than 100 grams, high vigor.

During a recent visit, Robert Dolph, Regional Office Entomologist (see Insect and Disease Activity on Wenatchee NF, Oct. 21, 1981), examined a number of lodgepole stands to determine vigor ratings. In general, thinned stands showed higher vigor ratings than unthinned stands. Also, trees attacked by mountain pine beetles had lower vigor ratings than uninfested trees.

What little white pine is present in the stand is heavily infected with blister rust, and most of the trees are dead. Blister rust infection is probably enhanced by the ideal moisture conditions at the river bottom site. The future of white pine in the stand is limited due to danger of blister rust.

SPECIFIC RECOMMENDATIONS - STAND 118

(1) Remove the remaining grand fir, especially those infected by *E. tinctorium*, to prevent further losses due to heart rot.

(2) Thin understory and pole-size trees where overstocked to increase tree vigor and prevent (a) infection by Indian paint fungus in grand fir, (b) scattered mortality due to fir engravers and Armillaria root rot in grand fir, and (c) attack by mountain pine beetles in lodgepole pine.

(3) Consider planting blister rust-resistant pine if white pine is a desired stand component. Forest Pest Management crews can further evaluate this stand to determine a more exact degree of blister rust hazard.

STAND 117

Stand 117 is 90 acres with a southwest aspect and slopes similar to Stands 121 and 122. Forty-nine plots, 13 of which were full-data plots, were used in the survey. The stand is composed primarily of Douglas-fir and ponderosa pine in the overstory and Douglas-fir and grand fir in the understory (Tables 4A, 4B, 4C, and 4D). Some grand fir, lodgepole pine, white pine, and Engelmann spruce are present in the overstory and understory. No recent harvesting is obvious in the stand.

Nearly 14% of the trees per acre ($\geq$5 in. DBH) representing 11% of the board-foot volume per acre are dead.

Pest problems afflicting major tree species in the stand include some laminated root rot and dwarf mistletoe in Douglas-fir and Armillaria root rot/bark beetle-caused mortality in ponderosa pine. Douglas-firs classified as "misc. dead" were killed by Armillaria root rot, Douglas-fir beetles (*D. pseudotsugae*), or were too deteriorated to determine cause of death.

Causes of death in minor tree species include Armillaria root rot, laminated root rot, and fir engravers in grand fir, mountain pine beetles in lodgepole pine, and blister rust and Armillaria root rot in white pine.

SPECIFIC RECOMMENDATIONS - STAND 117

(1) Maintain good stand vigor through stocking level control to reduce mortality caused by Armillaria root rot, fir engravers, and bark beetles (reduce pine B.A. to 60% of normal).

(2) Encourage more pine in the stand to reduce levels of laminated root rot and dwarf mistletoe. All pine species in the stand are more resistant to laminated root rot than Douglas-fir and grand fir. Also, the pines are not infected by Douglas-fir dwarf mistletoe[3/].

(3) If white pine is to be perpetuated in the stand, use of blister rust-resistant stock should be considered.

3/ Hawksworth, F. G. and D. Wiens. 1972. Biology and classification of dwarf mistletoes (*Arceuthobium*). Agr. Hndbk. No. 401, USDA Forest Service, Washington, D. C., 234 p.

STAND 151

Stand 151 is 157 acres, slightly rolling in topography, with a generally northern exposure. Thirty-six plots, all of which were full data plots (District data were not collected) were examined in the survey. The stand is composed mostly of Douglas-fir, ponderosa pine, and grand fir with most of the volume in Douglas-fir and ponderosa pine (Tables 5A, 5B, 5C, and 5D). The stand also contains some lodgepole pine, white pine, western redcedar, and western hemlock. The stand was partially logged within the last 5 years, and all of the understory is dead due to mechanical damage.

About 13% of the trees per acre ($\geq$5 in. DBH) representing over 8% of the board-foot volume per acre are dead.

The residual stand has infrequently-appearing pest problems that could cause substantial loss in the next rotation. Some of the Douglas-firs are infected with light amounts of dwarf mistletoe. Douglas-fir regeneration beneath such infected trees has a high probability of being infected after it reaches 3 feet tall or 10 years old, whichever occurs first. By rotation age, the infected regeneration may be unmerchantable because of the growth loss and malformation caused by dwarf mistletoe brooms.

In addition, very small amounts of laminated root rot and Armillaria root rot occur in grand fir and Douglas-fir in the stand. Infected trees are widely scattered and mortality may have been associated with weakened trees, especially trees affected by Armillaria root rot. Laminated root rot could become more of a problem in the future stand if grand fir and Douglas-fir regeneration is substantial.

Bark beetles and Armillaria root rot appear to be affecting stressed ponderosa pine, causing some scattered mortality.

All of the mortality listed under "other" species was caused by mountain pine beetles in lodgepole pine, except for the seedling class where logging damage was suspected. All white pine, cedar and hemlock appear to be healthy.

SPECIFIC RECOMMENDATIONS - STAND 151

(1) Remove or destroy mistletoe-infected residuals before susceptible regeneration becomes 3 feet tall or 10 years old, whichever occurs first.

(2) Encourage regeneration of species other than grand fir and Douglas-fir to reduce future incidence of laminated root rot and dwarf mistletoe.

(3) In the future, maintain good stocking levels to promote rapid tree growth and prevent mortality caused by Armillaria root rot and bark beetles (reduce pine B.A. to 60% of normal).

STAND 149

Stand 149 is 72 acres and, like Stand 118, is located in a flood plain along the Chiwawa River. Twenty-four plots, all full data plots (no District data were collected) were examined. The stand is composed chiefly of Douglas-fir, with lesser amounts of grand fir, white pine and lodgepole pine (Tables 6A, 6B, 6C, and 6D). Minor species include ponderosa pine, western redcedar, Engelmann spruce, and western hemlock. All understory trees are either dead or alive but infected with dwarf mistletoe or blister rust. No recent harvesting is evident in the stand.

Over 18% of the trees per acre ($\geq$ 5 in. DBH) representing 21% of the board-foot volume per acre are dead.

The most serious losses occur in white pine and are caused by blister rust or mountain pine beetles. Most of the blister rust-infected trees are still alive, but some mortality is evident. As in Stand 118, the river bottom location is probably conducive to heavy inoculum loads and subsequent infection in the trees. Serious losses associated with mountain pine beetles occur in trees possibly stressed by other factors such as overstocking or blister-rust infections that are not evident on the old snags and stubs. Most of the mortality in lodgepole pine is also caused by mountain pine beetles.

Causes of most of the losses in Douglas-fir categorized as "misc. dead" could not be identified. However, some of the mortality is associated with Armillaria root rot, which appeared to attack stressed trees as evident from the scattered nature of the mortality. Some Douglas-fir dwarf mistletoe is present but mostly at low infection levels.

Grand fir and the minor species all appear healthy.

SPECIFIC RECOMMENDATIONS - STAND 149

(1) Maintain stand vigor by shortening rotation ages in lodgepole pine to 80 years and white pine to 120-140 years to minimize attacks by mountain pine beetles. Basal area control will also reduce attacks by mountain pine beetles and mortality caused by Armillaria root rot.

(2) Remove dwarf mistletoe-infected Douglas-fir during stocking level control to prevent infection in susceptible understory trees.

(3) Harvest blister rust-infected white pine before they die and plant resistant stock if white pine is to be regenerated in the stand. FPM crews can hazard rate this stand.

STAND 148

Stand 148 is 30 acres and located along the Chiwawa River flood plain adjacent to Stand 149. Forty-four plots, 9 of which were full data plots, were used in the survey. The stand consists primarily of Douglas-fir with some grand fir, lodgepole pine, and white pine (Tables 7A, 7B, 7C, and 7D). Minor species include Engelmann spruce, Pacific silver fir, western redcedar and western hemlock. The stand is more lightly stocked than Stand 149, especially in the upper diameter classes. The understory is dense and comprised mostly of grand fir with some Douglas-fir, white pine and lodgepole pine. No recent harvesting is present in the stand.

Almost 12% of the trees per acre ($\geq$5 in. DBH) representing over 10% of the board-foot volume per acre are dead.

As with Stand 149, most of the pest problems occur in white pine and include blister rust and mountain pine beetles. All white pine listed as "misc. dead" appeared to be killed by mountain pine beetles except saplings, for which cause could not be determined.

Mountain pine beetles are causing mortality in large-diameter lodgepole pines. However, in seedlings and saplings western gall rust (*Endocronartium harknessii*) is causing most of the mortality. This disease can be common in lodgepole stands, and infection appears to be related to host genetics and environmental conditions. High humidity and cool conditions greatly enhance infection. Generally, this disease does not cause substantial mortality in older trees except by causing stem breakage. However, it probably does cause a reduction in growth rate. Also, heavily gall-rusted lodgepole may be predisposed to other opportunist-type pests such as Armillaria root rot or mountain pine beetles.

Causes of what little mortality occurs in other tree species could not be identified since most trees were very deteriorated.

SPECIFIC RECOMMENDATIONS - STAND 148

(1) Harvest blister rust-infected white pine or mountain pine beetle-infested lodgepole and white pine before affected trees die. FPM can hazard rate this stand for blister rust if white pine is to be regenerated.

(2) Remove blister rust-infected white pine and gall rust-infected lodgepole pine, especially trees with stem infections, during precommercial thinnings.

STAND 147

Stand 147 is 37 acres, adjacent to, and similar in character to Stand 148. Forty-nine plots, 9 of which were full data plots, were examined. This stand has much more Douglas-fir and white pine in the upper diameter classes than does Stand 148 (Tables 8A, 8B, 8C, and 8D). Understory species are the same as those in Stand 148, but stocking is much lower. No recent harvesting is evident in this stand.

Almost 15% of the trees per acre ($\geq$5 in. DBH) representing 9% of the board-foot volume per acre are dead.

Pest problems are similar to those in Stand 148. Blister rust and mountain pine beetles are prevalent in white pine and mountain pine beetles are prevalent in lodgepole pine. In addition, the old-growth Douglas-fir is either infected with dwarf mistletoe (light infections) or is dead and infected by *Polyporus schweinitzii*, cause of red-brown butt rot. This fungus commonly is associated with old-growth Douglas-fir and, in addition to causing extensive butt and lower bole rot, may cause mortality either directly or indirectly as a result of windthrow or stem breakage.

Indian paint fungus is present in grand fir at about the same level as in Stand 118. Miscellaneous mortality in grand fir is caused by Indian paint fungus (stem breakage), Armillaria root rot, or, in most cases, causes could not be identified.

SPECIFIC RECOMMENDATIONS - STAND 147

(1) Harvest blister rust-infected and mountain pine beetle-infested white pine before affected trees die. Introduce rust-resistant stock, if white pine is to be managed.

(2) Thin understory and pole-size trees where necessary to increase tree vigor and prevent (a) infection by Indian paint fungus in grand fir and (b) attack by mountain pine beetles in lodgepole and white pine.

(3) Remove old-growth Douglas-firs that are declining and subject to mortality caused by dwarf mistletoe and/or red-brown butt rot.

STAND 146

Stand 146 is 147 acres with rolling topography and a slight southerly exposure. Seventy-five plots, 13 of which were full data plots, were used. The stand is primarily grand fir by stem count but mostly Douglas-fir by volume (Tables 9A, 9B, 9C, and 9D). Some large-diameter ponderosa pines are also present. Minor species include white and lodgepole pine. The understory is mostly grand fir with some Douglas-fir. The stand was partially cut within the last 3 years.

Only 8% of the trees per acre ($\geq$5 in. DBH) representing 4% of the board-foot volume per acre are dead.

Major disease and insect problems are not conspicuous in this stand. Very scattered mortality is caused by laminated root rot, Armillaria root rot, or fir engravers in grand fir; dwarf mistletoe in Douglas-fir; and Armillaria root rot in ponderosa pine. Some dwarf mistletoe infections occur in living Douglas-firs, but most infections are very light.

SPECIFIC RECOMMENDATIONS - STAND 146

(1) Maintain good stocking levels to sustain tree vigor and prevent mortality caused by fir engravers and Armillaria root rot.

(2) Harvest or kill dwarf mistletoe-infected Douglas-firs before susceptible regeneration reaches 3 feet tall or 10 years old, whichever occurs first.

STAND RECOMMENDATION SUMMARIES

The following summarizes the nine stands we surveyed in decreasing order of treatment priority, i.e., stands listed first are currently sustaining the greatest loss and should be treated first:

Stand No.	Major Host-Pest Complexes	Recommended Treatments
121 and 122	*Laminated root rot - Douglas-fir - grand fir *Armillaria root rot - Douglas-fir -ponderosa pine *Fir engraver - grand fir *Mt. pine beetle - ponderosa pine - lodgepole pine *Dwarf mistletoe - Douglas-fir	*Stand conversion to pine. *Maintain good tree vigor through stocking level control.
117	Same as above but to a lesser degree.	*Encourage more pine. *Maintain good tree vigor through stocking level control.
147	*Blister rust-white pine *Mt. pine beetle - white pine - lodgepole pine *Dwarf mistletoe - Douglas-fir *Indian paint fungus - grand fir	*Salvage infected or infested lodgepole pine and white pine. *Thin overstocked grand fir, lodgepole, and white pine understory. *Remove declining, old-growth Douglas-firs.
149	*Blister rust - white pine *Mountain pine beetle - white pine -lodgepole pine	*Salvage infected or infested lodgepole pine and white pine. *Maintain good tree vigor through stocking level control.
151	*Dwarf mistletoe - Douglas-fir *Laminated root rot - Douglas-fir - grand fir *Armillaria root rot - ponderosa pine *Mt. pine beetle - lodgepole pine	*Remove mistletoe-infected residuals before regeneration is 3 feet tall or 10 years old. *Encourage more pine. *Maintain good tree vigor. through stocking level control.

Stand No.	Major Host-Pest Complexes	Recommended Treatments
148	*Mt. pine beetle - white pine -lodgepole pine *Blister rust - white pine *Gall rust - lodgepole pine	*Salvage infected or infested lodgepole pine and white pine. *Thin rust-infected understory.
118	*Indian paint fungus - grand fir *Mt. pine beetle - lodgepole pine *Root rot/fir engravers - grand fir	*Salvage grand fir with heart rot. *Maintain tree vigor through stocking level control.
146	*Root rot/fir engravers - grand fir *Armillaria root rot - ponderosa pine *Dwarf mistletoe - Douglas-fir	*Maintain tree vigor through stocking level control. *Remove mistletoe-infected residuals before regeneration is 3 feet tall or 10 years old.

The following implications should be considered when formulating silvicultural prescriptions for the stands we surveyed:

1. No treatment.

Disease and insect-caused mortality will increase and be especially damaging in the following stands: Root diseases/Bark beetles - Stands 117, 121, 122

Mountain pine beetles - Stands 147, 148, 149

Blister rust - Stands 147, 148, 149

Dwarf mistletoe - Stands 121, 122, 149, 151

Indian paint fungus - Stands 118, 147

2. Sanitation-salvage operations

Wood that would normally be lost from disease and insects will be saved by sanitation-salvage. However, in stands with severe root disease (117, 121, and 122), damage will continue and may even increase on the site.

Stands with moderate or light amounts of root diseases may become seriously damaged if salvage operations continue for several decades with no other treatments.

3. Seedtree, shelterwood, or thinning operations

Most diseased or insect infested trees will be removed in one or two operations. Disease and insect-caused mortality will decrease if (a) care is taken to leave uninfected residuals, (b) grand fir and Douglas-fir are discriminated against in root-diseased stands, especially stands 117, 121, 122, and (c) wounding in residual trees, especially grand fir, is minimized.

4. Clearcutting operations

All diseased or insect-infested trees, at least merchantable ones, will be removed in one operation. Disease and insect-caused mortality will be insignificant in the next stand if (1) all diseased residuals/advanced regeneration are destroyed during logging, and (2) only pine is planted or allowed to regenerate in stands with severe laminated root rot.

The information and recommendations presented in this report have been specifically formulated for the area we surveyed. Although some of this information may be applied to other areas in Oregon and Washington experiencing similar pest problems, these areas may be sufficiently different from the area we surveyed to warrant a separate biological evaluation to formulate management alternatives specific to that area. FPM pathologists encourage and are available to perform such evaluations at the request of land managers.

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Gregory M. Filip, Plant Pathologist — Date

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James S. Hadfield, Supervising Pathologist — Date

Approved by: Paul E. Buffam — 4/6/82
Paul E. Buffam, Director, FPM — Date

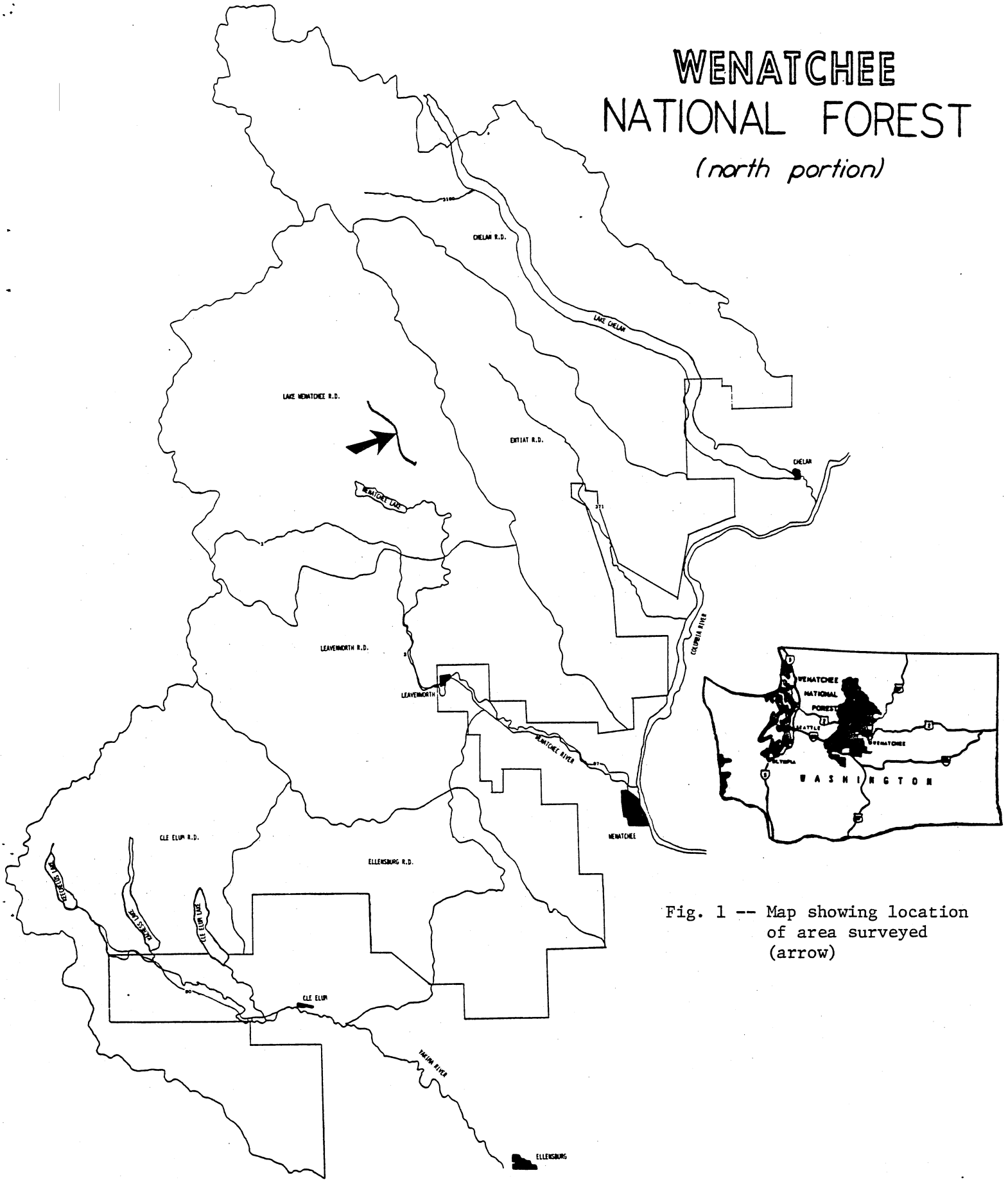
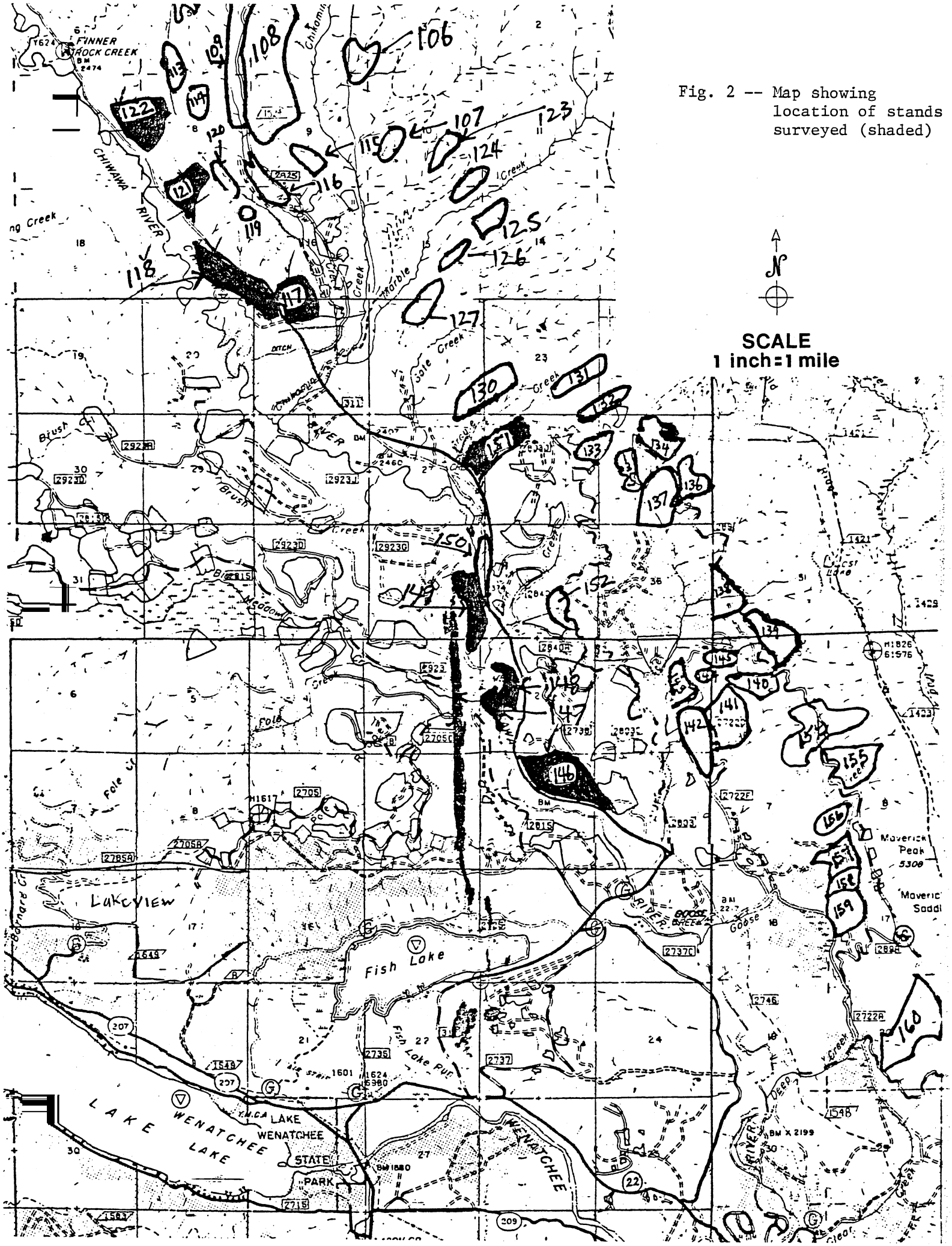


Fig. 1 -- Map showing location of area surveyed (arrow)


SCALE
1 inch = 1 mile
N
Lakeview
Fish Lake
LAKE WENATCHEE STATE PARK
Y.M.C.A. LAKE WENATCHEE
Maverick Peak 5309
Chiwawa River
Fig. 2 -- Map showing location of stands surveyed (shaded)

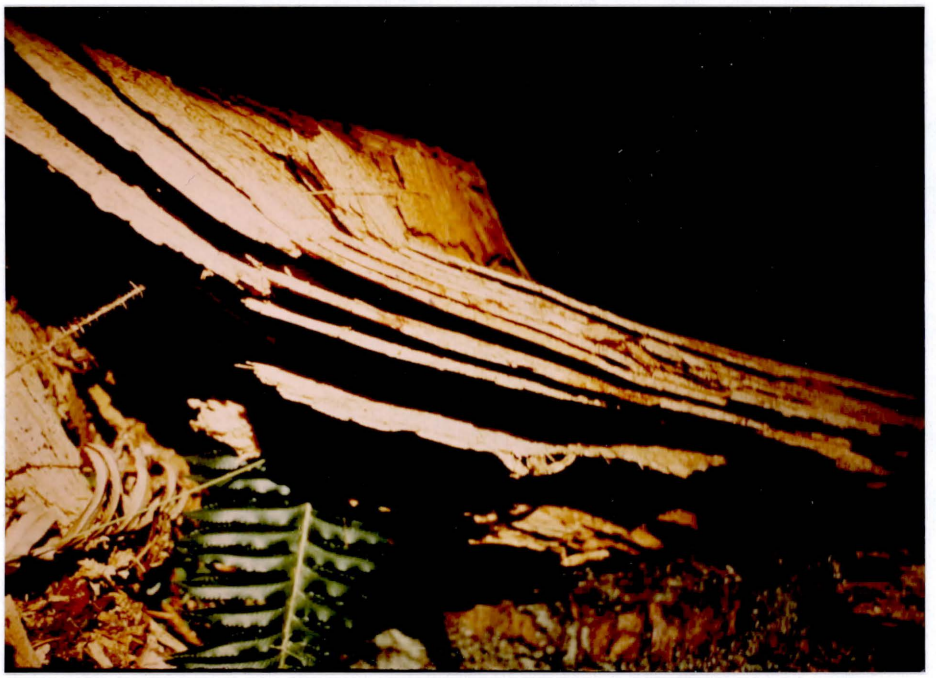


Fig. 3 Laminated decay caused by *Phellinus weirii*.

Fig. 4 Mycelial fans of *Armillaria mellea* under the bark of a dying grand fir.

Table 1A--Incidence (trees per acre) of major diseases and insect damage in Stand 122 by DBH class

STAND 122

DBH Class	GRAND FIR		DOUGLAS-FIR					PONDEROSA PINE				OTHER[1]	
	Healthy	Root Rot Fir Engraver Dead	Healthy	Dwarf Mistletoe Live	P. weirii Dead	A. mellea Dead	Misc. Dead	Healthy	A. mellea Dead	Bark Beetles Dead	Misc. Dead	Blister Rust	Misc. Dead
Inches	TREES PER ACRE												
Seedling	20.0		6.7										
Sapling	33.3	1.8	33.3			1.8	3.6						
6		3.7	27.2			3.7	3.7		3.7	3.7			
8			7.6		6.2	2.1							
10			9.8			1.3		4.9	2.7	1.3	2.7		2.7
12	6.8	0.9	10.2	1.9	1.9						1.9		
14	2.5		12.5	0.7	2.7	0.7		2.5	0.7	1.4	1.4		1.4
16			9.6	0.5	2.1			3.8	1.6		0.5	0.5	
18			7.5		1.6								
20		0.3	4.9	0.3	0.3		0.3	3.7			0.3		
22	1.0		3.0		0.6								
24	0.8	0.2	5.9		0.5		0.2	0.8					
26			1.4	0.2	0.6								
28			3.1		0.2	0.2							
30			1.6	0.1			0.1	0.5					
32			0.8	0.1			0.1						
34			0.4										
36			0.8	0.2				0.8	0.1				
38			0.3					1.4					
42			0.3	0.08				0.3					
44								0.3			0.07		
46			0.2					0.2					
48			0.2	0.06									
50								0.2					
62						0.04		0.1					
Total*	11.1	5.1	107.3	4.1	16.7	8.0	4.4	19.5	8.8	6.4	6.9	0.5	4.1
Percent* (within species)	69	31	76	3	12	6	3	47	21	15	17	11	89

* Excludes seedlings and saplings

1/ Includes lodgepole pine and white pine

Table 1B--Incidence (basal area per acre) of major diseases and insect damage in Stand 122 by DBH class

STAND 122

DBH Class	GRAND FIR		DOUGLAS-FIR					PONDEROSA PINE				OTHER*	
	Healthy	Root Rot Fir Engraver Dead	Healthy	Dwarf Mistletoe Live	P. weirii Dead	A. mellea Dead	Misc. Dead	Healthy	A. mellea Dead	Bark Beetles Dead	Misc. Dead	Blister Rust	Misc. Dead
Inches	BASAL AREA (FT^2) PER ACRE												
6		0.7	5.3			0.7	1.5		0.7	0.7			
8			2.7		2.2	0.7							
10			5.3			0.7		2.7	1.5	0.7	1.5		1.5
12	5.3	0.7	8.0	1.5	1.5						1.5		
14	2.7		13.4	0.7	2.9	0.7		2.7	0.7	1.5	1.5		1.5
16			13.4	0.7	2.9			5.3	2.2		0.7	0.7	
18			13.4		2.9								
20		0.7	10.7	0.7	0.7		0.7	8.0			0.7		
22	2.7		8.0		1.5								
24	2.7	0.7	18.7		1.5		0.7	2.7					
26			5.3	0.7	2.2								
28			13.4		0.7								
30			8.0	0.7			0.7	2.7					
32			2.7	0.7			0.7						
34			2.7										
36			5.3	1.5				5.3	0.7				
38			2.7					10.7					
42			2.7	0.7				2.7					
44								2.7			0.7		
46			2.7					2.7					
48			2.7	0.7									
50								2.7					
62						0.7		2.7					
Total	13.4	2.8	147.1	8.6	19.0	3.5	4.3	53.6	5.8	2.9	5.9	0.7	3.0
Percent (within species)	83	17	81	5	10	2	2	79	9	4	8	19	81

*Includes lodgepole pine and white pine

Table 1C--Incidence (cubic feet per acre) of major diseases and insect damage in Stand 122 by DBH class

STAND 122

DBH Class	GRAND FIR		DOUGLAS-FIR					PONDEROSA PINE				OTHER*	
	Healthy	P. weirii S. ventralis Dead	Healthy	Dwarf Mistletoe Live	P. weirii Dead	A. mellea Dead	Misc. Dead	Healthy	A. mellea Dead	Bark Beetles Dead	Misc. Dead	Blister Rust	Misc. Dead
Inches	CUBIC FEET PER ACRE												
6		13.8	87.6			11.9	11.9		11.4	11.4			
8			56.8		46.4	15.7							
10			141.2			18.7		76.1	41.9	20.2	41.9		38.9
12	173.0	22.9	238.1	44.3	44.3						45.7		
14	95.6		427.3	23.9	92.3	23.9		83.7	23.4	46.9	46.9		57.6
16			461.3	24.0	100.9			159.0	66.9		20.9	22.5	
18			461.3		98.4								
20		27.8	385.0	23.6	23.6		23.6	340.1			27.6		
22	127.2		335.6		67.1								
24	122.8	30.7	802.3		68.0		27.2	112.2					
26			231.0	33.0	99.0								
28			593.5		38.3	38.3							
30			342.7	21.4			21.4	111.2					
32			195.0	24.4			24.4						
34			113.0										
36			277.9	69.5				239.2	29.9				
38			109.3					633.6					
42			154.4	41.2				158.9					
44								142.7			33.3		
46			135.1					121.1					
48			113.7	34.1									
50								156.8					
62						37.6		129.3					
Total	518.6	95.2	5662.1	339.4	678.3	146.1	108.5	2463.9	173.5	78.5	216.3	22.5	96.5
Percent (within species)	84	16	82	5	10	2	1	84	6	3	7	19	81

* Includes lodgepole pine and white pine

Table 1D--Incidence (board feet per acre) of major diseases and insect damage in Stand 122 by DBH class

STAND 122

DBH Class	GRAND FIR		DOUGLAS-FIR					PONDEROSA PINE				OTHER*	
	Healthy	P. weirii S. ventralis Dead	Healthy	Dwarf Mistletoe Live	P. weirii Dead	A. mellea Dead	Misc. Dead	Healthy	A. mellea Dead	Bark Beetles Dead	Misc. Dead	Healthy	Misc. Dead
Inches	BOARD FEET PER ACRE												
10			299			40		185	102	49	102		83
12	699	93	868	162	162						176		
14	451		1894	106	409	106		384	107	215	215		259
16			2302	120	504			782	329		103	195	
18			3887		518								
20		160	2152	132	132		132	1948			158		
22	771		1983		397								
24	766	191	4863		412		165	688					
26			1440	206	617								
28			3767		243	243							
30			2198	137			137	719					
32			1266	158			158						
34			743										
36			1871	468				1573	197				
38			734					4395					
42			1074	287				1111					
44								975			227		
46			961					850					
48			779	234									
50								1123					
62						240		959					
Total	2687	444	33081	2010	3394	629	592	15692	735	264	981	195	342
Percent (within species)	86	14	83	5	9	2	1	89	4	1	6	36	64

* Includes lodgepole pine and white pine

Table 2A—Incidence (trees per acre) of major diseases and insect damage in Stand 121 by DBH class

STAND 121

DBH Class	GRAND FIR			DOUGLAS-FIR					PONDEROSA PINE			REDCEDAR
		P. weirii	Misc.		Dwarf	P. weirii		Misc.		A. mellea	Misc.	
	Healthy	Dead	Dead	Healthy	Mistletoe	Live	Dead	Dead	Healthy	Dead	Dead	Healthy
Inches	TREES PER ACRE											
Seedling	163.6			27.3								90.9
Sapling	45.5	2.0	4.0	9.1	4.0		2.0	18.0			6.0	9.1
6		8.2	4.1	19.0						4.1		
8					2.3	2.3				4.6	2.3	
10		2.9	1.5	20.0	1.5	1.5	1.5	2.9	20.0	2.9	1.5	
12		3.1	1.0	4.6	2.0		1.0	2.0	4.6	1.0		4.6
14		1.5	0.7	6.8	1.5	0.7	0.7	0.7		0.7	1.5	
16		1.1		23.4	0.6		1.1	0.8	5.2	0.6	1.7	
18	2.1	0.5		8.2	0.5	0.5	0.5		2.1			
20	1.7			3.3	0.7	0.4	1.1					
22	4.1			1.4	0.6						0.3	
24	1.2			1.2							0.3	
26				2.0	0.2							
28	0.9	0.2			0.2				0.9	0.2		0.9
30									0.7			
32					0.9			0.1				
34				0.6	0.1				0.6			
36								0.1	1.0	0.1		
38					0.1							
40									1.2			
42									0.4			
44									0.3			0.3
46									0.3			
50					0.06							
52					0.05							
Total*	10.0	17.5	7.3	90.5	11.3	5.4	5.9	6.6	37.3	14.2	7.6	5.8
Percent* (within species)	29	50	21	76	9	5	5	5	63	24	13	100

* Excludes seedlings and saplings

Table 2B--Incidence (basal area per acre) of major diseases and insect damage in Stand 121 by DBH class

STAND 121

DBH Class	GRAND FIR			DOUGLAS-FIR					PONDEROSA PINE			REDCEDAR
		P. weirii	Misc.		Dwarf	P. weirii		Misc.		A. mellea	Misc.	
	Healthy	Dead	Dead	Healthy	Mistletoe	Live	Dead	Dead	Healthy	Dead	Dead	Healthy
Inches	BASAL AREA (FT^2) PER ACRE											
6		1.6	0.8	3.6						0.8		
8					0.8	0.8				1.6	0.8	
10		1.6	0.8	10.9	0.8	0.8	0.8	1.6	10.9	1.6	0.8	
12		2.4	0.8	3.6	1.6		0.8	1.6	3.6	0.8		3.6
14		1.6	0.8	7.3	1.6	0.8	0.8	0.8		0.8	1.6	
16		1.6		32.8	0.8		1.6	0.8	7.3	0.8	2.4	
18	3.6	0.8		14.6	0.8	0.8	0.8		3.6			
20	3.6			7.3	1.6	0.8	2.4					
22	10.9			3.6	1.6						0.8	
24	3.6			3.6							0.8	
26				7.3	0.8							
28	3.6	0.8			0.8				3.6	0.8		3.6
30								0.8	3.6			
32					4.8							
34				3.6	3.2			0.8	3.6			
36									7.3	0.8		
38					0.8							
40									10.9			
42									3.6			
44									3.6			3.6
46									3.6			
50					0.8							
52					0.8							
Total	25.3	10.4	3.2	98.2	21.6	4.0	7.2	6.4	65.2	8.0	7.2	10.8
Percent (within species)	65	27	8	71	16	3	5	5	81	10	9	100

Table 2C--Incidence (cubic feet per acre) of major diseases and insect damage in Stand 121 by DBH class

STAND 121

DBH Class	GRAND FIR			DOUGLAS-FIR					PONDEROSA PINE			REDCEDAR
		P. weirii	Misc.		Dwarf	P. weirii		Misc.		A. mellea	Misc.	
	Healthy	Dead	Dead	Healthy	Mistletoe	Live	Dead	Dead	Healthy	Dead	Dead	Healthy
Inches	CUBIC FEET PER ACRE											
6		30.7	15.3	61.2						12.6		
8					17.2	17.2				42.3	21.2	
10		42.2	22.4	288.2	21.6	21.6	21.6	41.8	310.6	45.0	23.3	
12		78.9	25.4	107.4	46.7		23.3	46.7	110.6	24.0		69.3
14		57.4	26.8	232.4	51.3	23.9	23.9	23.9		23.4	36.1	
16		58.6		1124.4	28.8		52.9	38.4	217.5	25.1	71.1	
18	159.5	38.0		504.4	30.8	30.8	30.8		139.4			
20	157.3			259.3	55.0	31.4	86.4					
22	521.4			156.6	67.1						29.8	
24	184.1			163.2							42.1	
26				330.0	33.0							
28	200.4	44.5			38.3				191.8	42.6		116.0
30									155.7			
32					219.4			24.4				
34				169.5	28.3				179.4			
36								34.7	452.6	45.3		
38					36.4							
40									513.0			
42									211.9			
44									142.7			95.6
46									181.7			
50					41.9							
52					36.0							
Total	1222.7	350.3	89.9	3396.6	751.8	124.9	238.9	209.9	2806.9	260.3	223.6	280.9
Percent (within species)	74	21	5	72	16	3	5	4	85	8	7	100

Table 2D--Incidence (board feet per acre) of major diseases and insect damage in Stand 121 by DBH class

STAND 121

DBH Class	GRAND FIR			DOUGLAS-FIR					PONDEROSA PINE			REDCEDAR
	Healthy	P. weirii Dead	Misc. Dead	Healthy	Dwarf Mistletoe	P. weirii Live	P. weirii Dead	Misc. Dead	Healthy	A. mellea Dead	Misc. Dead	Healthy
Inches	BOARD FEET PER ACRE											
10		125	65	611	46	46	46	89	754	109	57	
12		319	103	391	170		85	170	425	92		219
14		271	126	1030	1258	106	106	106		107	230	
16		304		5611	144		264	192	1070	123	350	
18	890	212		2656	162	162	162		756			
20	909			1449	307	176	483					
22	3162			925	397						175	
24	1149			989							258	
26				2057	206							
28	1303	290			243				1236	275		672
30									1007			
32					1424			158				
34				1114	186				1089			
36								234	1967	197		
38					245							
40									3510			
42									1482			
44									975			602
46									1580			
50					295							
52					250							
Total	7413	1521	294	16833	5333	490	1146	949	15851	903	1070	1493
Percent (within species)	81	16	3	68	21	2	5	4	89	5	6	100

Table 3A--Incidence (trees per acre) of major diseases and insect damage in Stand 118 by DBH class

STAND 118

DBH CLASS	GRAND FIR			DOUGLAS-FIR	LODGEPOLE PINE		PONDEROSA PINE	WHITE PINE		ENGELMANN SPRUCE		OTHER[1/]
	Healthy	Indian Paint Fungus	Misc. Dead	Healthy	Healthy	Mountain Pine Beetle Dead	Healthy	Healthy	Blister Rust	Healthy	Misc. Dead	Healthy
Inches	TREES PER ACRE											
Seedling	56.3		5.3		6.3			18.8				25.0
Sapling	112.5		13.2	43.8	18.8			6.3		6.3	5.3	12.5
6	6.4		4.0	12.8		1.3				19.1		6.4
8	28.7			14.3	10.7	0.8		3.6	1.5	14.3		3.6
10	9.2		0.5	4.6	4.6	0.5				9.2		6.9
12	11.1		0.7	3.2	1.6				0.3	3.2		1.6
14	2.3		0.2	1.2		0.2				1.2		2.3
16			0.1	0.9						1.8		
18	0.7	0.1								0.7		0.7
20	0.6									1.1		1.1
22		0.1					0.5					0.9
24		0.08									0.07	0.4
26		0.07		0.3			0.7			0.3		
28			0.06				0.3					
30				0.3								0.6
32				0.2			0.4					
36												
38				0.2			0.2					0.2
42												
46				0.1								
Total*	59.0	0.4	5.6	38.1	16.9	2.8	2.1	3.6	1.8	50.9	0.1	24.7
Percent* (within species)	90	1	9	100	86	14	100	67	33	100	<1	100

* Excludes seedlings and saplings

1/ Includes Pacific silver fir, western redcedar, western hemlock, and black cottonwood

Table 3B--Incidence (basal area per acre) of major diseases and insect damage in Stand 118 by DBH class

STAND 118

DBH CLASS	GRAND FIR Healthy	GRAND FIR Indian Paint Fungus	GRAND FIR Misc. Dead	DOUGLAS-FIR Healthy	LODGEPOLE PINE Healthy	LODGEPOLE PINE Mountain Pine Beetle Dead	PONDEROSA PINE Healthy	WHITE PINE Healthy	WHITE PINE Blister Rust	ENGELMANN SPRUCE Healthy	ENGELMANN SPRUCE Misc. Dead	OTHER* Healthy
Inches	BASAL AREA (FT^2) PER ACRE											
6	1.3		0.8	2.5		0.3				3.8		1.3
8	10.0			5.0	3.8	0.3		1.3	0.5	5.0		1.3
10	5.0		0.3	2.5	2.5	0.3				5.0		3.8
12	8.8		0.5	2.5	1.3				0.3	2.5		1.3
14	2.5		0.3	1.3		0.3				1.3		2.5
16			0.3	1.3						2.5		
18	1.3	0.3								1.3		1.3
20	1.3									2.5		2.5
22		0.3					1.3					2.5
24		0.3									0.3	1.3
26		0.3		1.3			2.5			1.3		
28			0.3				1.3					
30				1.3								2.5
32				1.3			2.5					
36												
38				1.3			1.3					1.3
42												
46				1.3								
Total	30.2	1.2	2.5	21.6	7.6	1.2	8.9	1.3	0.8	25.2	0.3	21.6
Percent (within species)	90	3	7	100	86	14	100	62	38	99	1	100

*Includes Pacific silver fir, western redcedar, western hemlock, and black cottonwood

Table 3C--Incidence (cubic feet per acre) of major diseases and insect damage in Stand 118 by DBH class

STAND 118

DBH CLASS	GRAND FIR			DOUGLAS-FIR	LODGEPOLE PINE		PONDEROSA PINE	WHITE PINE		ENGELMANN SPRUCE		OTHER*
	Healthy	Indian Paint Fungus	Misc. Dead	Healthy	Healthy	Mountain Pine Beetle	Healthy	Healthy	Blister Rust	Healthy	Misc. Dead	Healthy
Inches	CUBIC FEET PER ACRE											
6	23.9		15.0	41.2		3.8				80.0		23.6
8	243.4			107.0	86.5	6.5		27.7	11.6	105.5		24.8
10	137.2		7.5	66.3	66.3	7.2				147.8		100.1
12	282.4		17.8	74.7	35.6				6.9	59.3		32.8
14	88.0		7.7	41.0		8.2				38.3		73.7
16			53.3	43.2						85.4		
18	53.2	7.6								47.8		46.1
20	55.5									98.1		59.0
22		12.7					49.7					48.3
24		12.3									10.5	57.2
26		14.3		49.5			130.1			52.4		
28			13.4				63.9					
30				64.3								127.0
32				48.8			116.8					
36												
38				72.9			90.5					56.4
42												
46				67.6								
Total	883.6	46.9	114.7	676.5	188.4	25.7	451.0	27.7	18.5	714.6	10.5	649.0
Percent (Within species)	85	4	11	100	88	12	100	60	40	99	1	100

*includes Pacific silver fir, western redcedar, western hemlock, and black cottonwood

Table 3D--Incidence (board feet per acre) of major diseases and insect damage in Stand 118 by DBH class

STAND 118

DBH CLASS	GRAND FIR Healthy	GRAND FIR Indian Paint Fungus	GRAND FIR Misc. Dead	DOUGLAS-FIR Healthy	LODGEPOLE PINE Healthy	LODGEPOLE PINE Mountain Pine Beetle	PONDEROSA PINE Healthy	WHITE PINE Healthy	WHITE PINE Blister Rust	ENGELMANN SPRUCE Healthy	ENGELMANN SPRUCE Misc. Dead	OTHER* Healthy
Inches	BOARD FEET PER ACRE											
10	396		22	141	141	15				433		271
12	1141		72	272	129				27	256		122
14	415		36	182		37				183		338
16			28	216						442		
18	297	42								262		251
20	321									570		324
22		77					263					241
24		77									64	148
26		92		309			827			331		
28			87				412					
30				412								517
32				317			780					
36												
38				490			628					360
42												
46				480								
Total	2570	288	245	2819	270	52	2910	0	27	2477	64	2572
Percent (Within species)	83	9	8	100	84	16	100	0	100	97	3	100

*Includes Pacific silver fir, western redcedar, western hemlock, and black cottonwood

Table 4A—Incidence (trees per acre) of major diseases and insect damage in Stand 117 by DBH class

STAND 117

DBH Class	DOUGLAS-FIR				PONDEROSA PINE			OTHER[1/]	
	Healthy	Dwarf Mistletoe Live	P. weirii Dead	Misc. Dead	Healthy	Bark beetles A. mellea dead	Misc. Dead	Healthy	Misc. Dead
Inches	TREES PER ACRE								
Seedling	7.7				7.7			69.2	8.2
Sapling	130.8		4.1	4.1	15.4			38.5	2.0
6	47.1								
8	8.8			4.7		2.3			4.7
10	39.5			1.5	5.6	1.5			6.0
12	19.6		1.0		3.9	2.1	1.0		3.1
14	20.1		1.5		4.4		0.8	2.9	
16	19.8								
18	7.0				8.7				0.9
20	1.4		1.1		5.6			2.8	1.1
22	2.3	0.3			3.5	0.3			
24			0.3		2.9		0.3		
26	0.8				1.7				
28	2.2								
30				0.2	0.6				
34	1.0			0.1					0.1
36				0.1	0.4				
40	0.4								
42	0.6	0.08			0.6				
48						0.06			
50	0.2	0.06							
56	0.2								
Total*	171.0	0.4	3.9	6.6	37.9	6.3	2.1	5.7	15.9
Percent* (Within species)	94	<1	2	4	82	14	4	26	74

* Excludes seedlings and saplings

1/ Includes grand fir, lodgepole pine, white pine, and Engelmann spruce

Table 4B--Incidence (basal area per acre) of major diseases and insect damage in Stand 117 by DBH class

STAND 117

DBH Class	DOUGLAS-FIR Healthy	Dwarf Mistletoe Live	P. weirii Dead	Misc. Dead	PONDEROSA PINE Healthy	Bark beetles A. mellea dead	Misc. Dead	OTHER* Healthy	Misc. Dead
Inches	BASAL AREA (FT^2) PER ACRE								
6	9.2								
8	3.1			1.6		0.8			1.6
10	21.6			0.8	3.1	0.8			3.3
12	15.4		0.8		3.1	1.6	0.8		2.5
14	21.6		1.6		6.2		0.8	6.2	
16	27.7								
18	12.3				15.4				2.5
20	3.1		2.5		12.3			3.1	1.6
22	6.2	0.8			9.2	0.8			
24			0.8		9.2		0.8		
26	3.1				6.2				
28	9.2								
30				0.8	3.1				
34	6.2			0.8					0.8
36				0.8	3.1				
40	3.1								
42	6.2	0.8			6.2				
48						0.8			
50	3.1	0.8							
56	3.1								
Total	154.2	2.4	5.7	4.8	77.1	4.8	2.4	9.3	12.3
Percent (Within species)	92	1	4	3	91	6	3	43	57

* Includes grand fir, lodgepole pine, white pine, and Engelmann spruce

Table 4C--Incidence (cubic feet per acre) of major diseases and insect damage in Stand 117 by DBH class

STAND 117

DBH Class	DOUGLAS-FIR				PONDEROSA PINE			OTHER*	
	Healthy	Dwarf Mistletoe Live	P. weirii Dead	Misc. Dead	Healthy	Bark beetles A. mellea dead	Misc. Dead	Healthy	Misc. Dead
Inches	CUBIC FEET PER ACRE								
6	151.7								
8	65.8			35.2		21.2			38.0
10	569.2			21.6	87.0	23.3			90.1
12	457.5		23.3		93.8	50.5	24.0		69.7
14	687.0		51.3		147.3		26.8	115.1	
16	951.4								
18	430.6				577.3				65.5
20	110.0		86.4		514.8			259.1	95.7
22	257.3	33.6			348.0	29.8			
24			40.8		406.7		42.1		
26	132.0				316.0				
28	421.2								
30				42.8	133.5				
34	282.5			28.3					35.0
36				34.7	119.6				
40	161.5								
42	308.8	41.2			317.8				
48						45.5			
50	139.6	41.9							
56	161.3								
Total	5287.4	116.7	201.8	162.6	3061.8	170.3	92.9	374.2	394.0
Percent (Within species)	92	2	3	3	92	5	3	49	51

* Includes grand fir, lodgepole pine, white pine, and Engelmann spruce

Table 4D--Incidence (board feet per acre) of major diseases and insect damage in Stand 117 by DBH class

STAND 117

DBH Class	DOUGLAS-FIR				PONDEROSA PINE			OTHER*	
	Healthy	Dwarf Mistletoe Live	P. weirii Dead	Misc. Dead	Healthy	Bark beetles A. mellea dead	Misc. Dead	Healthy	Misc. Dead
Inches	BOARD FEET PER ACRE								
10	1207			46	211	57			231
12	1667		85		361	194	92		257
14	3046		227		675		123	530	
16	4747								
18	2267				3130				427
20	615		483		2948			1498	644
22	1520	198			2037	176			
24			247		2492		258		
26	823				2007				
28	2673								
30				275	863				
34	1857			186					272
36				234	787				
40	1093								
42	2148	286			2223				
48						326			
50	985	295							
56	1136								
Total	25784	779	1042	741	17734	753	473	2028	1831
Percent (Within species)	90	3	4	3	94	4	2	53	47

* Includes grand fir, lodgepole pine, white pine, and Engelmann spruce

Table 5A--Incidence (trees per acre) of major diseases and insect damage in Stand 151 by DBH class

STAND 151

DBH Class	GRAND FIR		DOUGLAS-FIR			PONDEROSA PINE		OTHER[1/]	
	Healthy	Misc. Dead	Healthy	Dwarf Mistletoe Live	Misc. Dead	Healthy	Misc. Dead	Healthy	Misc. Dead
Inches	TREES PER ACRE								
Seedling		2.8			16.7				2.8
Sapling		5.6			27.8				
6	8.5	2.8	5.7		2.8			5.7	
8	23.9		4.8		1.6			3.2	
10	12.2	1.0	6.1		2.0		1.0	5.1	
12	1.4		9.2	0.7	0.7	0.7	0.7		1.4
14	2.1	1.0	1.6		0.5	2.1			0.5
16	0.4		6.4	1.2	1.2	2.0		0.4	0.4
18	0.6		5.3	0.3	0.3	1.6		0.3	
20	0.8		3.1	0.3		1.8		0.5	
22	0.4	0.2	1.9	0.4		0.2		0.4	
24	0.2		0.9			0.9	0.2	0.4	
26			0.3			0.6		0.3	
28						0.4			
32			0.1	0.1					
34						0.1			
42						0.06			
44			0.05						
Total*	50.5	5.0	45.5	3.0	9.1	10.5	1.9	16.3	2.3
Percent* (Within species)	91	9	79	5	16	85	15	88	12

* Excludes seedlings and saplings

1/ Includes lodgepole pine, white pine, western redcedar, and western hemlock

Table 5B--Incidence (basal area per acre) of major diseases and insect damage in Stand 151 by DBH class

STAND 151

DBH Class	GRAND FIR		DOUGLAS-FIR			PONDEROSA PINE		OTHER*	
	Healthy	Misc. Dead	Healthy	Dwarf Mistletoe Live	Misc. Dead	Healthy	Misc. Dead	Healthy	Misc. Dead
Inches	BASAL AREA (FT^2) PER ACRE								
6	1.7	0.6	1.1		0.6			1.1	
8	8.4		1.7		0.6			0.6	
10	6.7	0.6	3.4		1.1		0.6	2.8	
12	1.1		7.3	0.6	0.6	0.6	0.6		1.1
14	2.2	1.1	1.7		0.6	2.2			0.6
16	0.6		9.0	1.7	1.7	2.8		0.6	0.6
18	1.1		9.5	0.6	0.6	2.8		0.6	
20	1.7		6.7	0.6		3.9		1.1	
22	1.1	0.6	5.0	1.1		1.7		1.1	
24	0.6		2.8			2.8	0.6	1.1	
26			1.1			2.2		1.1	
28						1.7			
32			0.6	0.6					
34						0.6			
42						0.6			
44			0.6						
Total	25.2	2.9	50.5	5.2	5.8	21.9	1.8	10.1	2.3
Percent (Within species)	90	10	82	9	9	92	8	81	19

* Includes lodgepole pine, white pine, western redcedar, and western hemlock

Table 5C--Incidence (cubic feet per acre) of major diseases and insect damage in Stand 151 by DBH class

STAND 151

DBH Class	GRAND FIR		DOUGLAS-FIR			PONDEROSA PINE		OTHER*	
	Healthy	Misc. Dead	Healthy	Dwarf Mistletoe Live	Misc. Dead	Healthy	Misc. Dead	Healthy	Misc. Dead
Inches	CUBIC FEET PER ACRE								
6	31.8	10.5	18.4		9.0			15.4	
8	202.7		35.9		12.0			19.6	
10	181.9	14.9	87.9		28.8		15.5	65.9	
12	35.6		214.7	16.3	16.3	16.8	16.8		31.1
14	80.3	38.3	54.7		17.1	70.3			20.6
16	21.3		307.5	57.7	57.7	83.7		20.0	23.0
18	45.6		326.0	18.5	18.5	106.2		21.6	
20	74.0		243.6	23.6		165.5		29.0	
22	50.9	25.4	212.6	44.8		19.9		21.4	
24	30.7		122.4			126.2	28.1	49.6	
26			49.5			111.5		30.0	
28						85.2			
32			24.4	24.4					
34						27.6			
42						31.8			
44			29.6						
Total	754.8	89.1	1727.2	185.3	159.4	844.7	60.4	272.5	74.7
Percent (Within species)	89	11	83	9	8	93	7	78	22

* Includes lodgepole pine, white pine, western redcedar, and western hemlock

Table 5D--Incidence (board feet per acre) of major diseases and insect damage in Stand 151 by DBH class

STAND 151

DBH Class	GRAND FIR		DOUGLAS-FIR			PONDEROSA PINE		OTHER*	
	Healthy	Misc. Dead	Healthy	Dwarf Mistletoe Live	Misc. Dead	Healthy	Misc. Dead	Healthy	Misc. Dead
Inches	BOARD FEET PER ACRE								
10	526	43	186		61		38	139	
12	144		782	60	60	65	65		113
14	379	180	242		76	322			93
16	110		1535	345	345	411		132	117
18	254		1717	97	97	576		165	
20	428		1362	132		948		147	
22	308	154	1256	264		116		107	
24	192		742			773	172	374	
26			309			708		168	
28						549			
32			158	158					
34						182			
42						254			
44			210						
Total	2341	377	8499	1056	639	4904	275	1232	323
Percent (Within species)	86	14	83	11	6	95	5	79	21

* Includes lodgepole pine, white pine, western redcedar, and western hemlock

Table 6A--Incidence (trees per acre) of major diseases and insect damage in Stand 149 by DBH class

STAND 149

DBH Class	GRAND FIR	DOUGLAS-FIR			WHITE PINE			LODGEPOLE PINE		OTHER[1/]
	Healthy	Healthy	Dwarf Mistletoe Live	Misc. Dead	Healthy	Blister Rust	Mountain Pine Beetle	Healthy	Misc. Dead	Healthy
Inches	TREES PER ACRE									
Seedling						8.3			4.2	
Sapling			8.3	29.2					4.2	
6	17.0	42.5		17.0	17.0	25.5	8.5	8.5		8.5
8	9.5	28.6		4.8			4.8	9.5		9.5
10	9.2	12.2		3.1			6.1	3.1		9.2
12	10.6	10.6	2.1		4.2		2.1	4.2	6.4	
14		7.8	1.6		1.6	1.6	1.6		1.6	
16	2.4	8.4		2.4		1.2	2.4	1.2		2.4
18	1.9	1.9			0.9					
20		0.8					0.8			
22		0.6		0.6						
24	0.5	2.1		0.5		0.5				
26		0.5		0.5						
30		0.7								
32		0.6								
38		0.2		0.2						
40		0.2								
42		0.2								
Total*	51.1	117.9	3.7	29.1	23.7	28.8	26.3	26.5	8.0	29.6
Percent* (Within species)	100	78	3	19	30	37	33	77	23	100

* Excludes seedlings and saplings

1/ Includes ponderosa pine, western redcedar, Engelmann spruce, and western hemlock

Table 6B--Incidence (basal area per acre) of major diseases and insect damage in Stand 149 by DBH class

STAND 149

DBH Class	GRAND FIR	DOUGLAS-FIR			WHITE PINE			LODGEPOLE PINE		OTHER*
	Healthy	Healthy	Dwarf Mistletoe Live	Misc. Dead	Healthy	Blister Rust	Mountain Pine Beetle	Healthy	Misc. Dead	Healthy
Inches	BASAL AREA (FT^2) PER ACRE									
6	3.3	8.4		3.3	3.3	5.0	1.7	1.7		1.7
8	3.3	10.0		1.7			1.7	3.3		3.3
10	5.0	6.9		1.7			3.3	1.7		5.0
12	8.4	8.4	1.7		3.3		1.7	3.3	5.0	
14		8.4	1.7		1.7	1.7	1.7		1.7	
16	3.3	11.7		3.3		1.7	3.3	1.7		3.3
18	3.3	3.3			1.7					
20		1.7					1.7			
22		1.7		1.7						
24	1.7	6.9		1.7		1.7				
26		1.7		1.7						
30		3.3								
32		3.3								
38		1.7		1.7						
40		1.7								
42		1.7								
Total	28.3	80.8	3.4	16.8	10.0	10.1	15.1	11.7	6.7	13.3
Percent* (Within species)	100	80	3	17	28	29	43	64	36	100

* Includes ponderosa pine, western redcedar, Engelmann spruce, and western hemlock

Table 6C--Incidence (cubic feet per acre) of major diseases and insect damage in Stand 149 by DBH class

STAND 149

DBH Class	GRAND FIR	DOUGLAS-FIR			WHITE PINE			LODGEPOLE PINE		OTHER*
	Healthy	Healthy	Dwarf Mistletoe Live	Misc. Dead	Healthy	Blister Rust	Mountain Pine Beetle	Healthy	Misc. Dead	Healthy
Inches	CUBIC FEET PER ACRE									
6	63.6	136.9		54.7	42.5	63.8	21.3	24.7		31.3
8	80.6	213.9		35.9			37.0	76.8		57.0
10	137.2	175.8		44.7			96.6	44.8		136.4
12	269.7	247.4	49.0		96.6		48.3	93.4	142.3	
14		266.6	54.7		52.5	52.5	52.5		65.8	
16	127.8	403.6		115.3		51.6	103.2	68.9		113.8
18	144.3	116.9			64.8					
20		62.9					76.0			
22		67.1		67.1						
24	76.7	285.6		68.0		88.5				
26		82.5		82.5						
30		149.9								
32		146.3								
38		72.9		72.9						
40		80.8								
42		102.9								
Total	899.9	2612.0	103.7	541.1	256.4	256.4	434.9	308.6	208.1	338.5
Percent* (Within species)	100	80	3	17	27	27	46	60	40	100

* Includes ponderosa pine, western redcedar, Engelmann spruce, and western hemlock

Table 6D--Incidence (board feet per acre) of major diseases and insect damage in Stand 149 by DBH class

STAND 149

DBH Class	GRAND FIR	DOUGLAS-FIR			WHITE PINE			LODGEPOLE PINE		OTHER*
	Healthy	Healthy	Dwarf Mistletoe Live	Misc. Dead	Healthy	Blister Rust	Mountain Pine Beetle	Healthy	Misc. Dead	Healthy
Inches	BOARD FEET PER ACRE									
10	396	373		95			231	95		354
12	1090	902	179		372		186	340	518	
14		1182	242		241	241	241		296	
16	663	2014		575		468	936	350		590
18	805	443			495					
20		351					608			
22		397		397						
24	479	1731		206		750				
26		514		514						
30		961								
32		950								
38		490		490						
40		547								
42		716								
Total	3433	11571	421	2277	1108	1459	2202	785	814	944
Percent (Within species)	100	81	3	16	23	31	46	49	51	100

* Includes ponderosa pine, western redcedar, Engelmann spruce, and western hemlock

Table 7A--Incidence (trees per acre) of major diseases and insect damage in Stand 148 by DBH class

STAND 148

DBH Class	GRAND FIR		DOUGLAS-FIR		WHITE PINE				LODGEPOLE PINE				OTHER[1]	
						Blister Rust					Mt.			
	Healthy	Misc. Dead	Healthy	Misc. Dead	Healthy	Live	Dead	Misc. Dead	Healthy	Gall Rust Dead	Pine Beetle	Misc. Dead	Healthy	Misc. Dead
Inches	TREES PER ACRE													
Seedling	1344.4	4.5	555.6	22.7	311.1	2.3	2.3		144.4	15.9			111.1	
Sapling	288.9	6.8	255.6	13.6	33.3	18.2	6.8	6.8	88.9	2.3		11.4	33.3	2.3
6			45.4				9.3							
8	25.5	2.6	25.5	2.6		2.6	7.8		12.7		7.8		12.7	
10	24.4		8.1		8.1				24.4		1.7			
12	11.3		11.3			1.2			11.3				5.7	
14	4.2					0.9							4.2	
16			6.4			0.7		0.7						
18			2.5					0.7						
20			2.0											
22								0.4						0.4
24			1.4											0.3
26			1.2											
Total*	65.4	2.6	103.8	2.6	8.1	5.4	17.1	1.8	48.4		9.5		22.6	0.7
Percent* (Within species)	96	4	98	2	25	17	53	5	84		16		97	3

* Excludes seedlings and saplings

1/ Includes Engelmann spruce, Pacific silver fir, western redcedar, and western hemlock

Table 7B--Incidence (basal area per acre) of major diseases and insect damage in Stand 148 by DBH class

STAND 148

DBH Class	GRAND FIR		DOUGLAS-FIR		WHITE PINE				LODGEPOLE PINE		OTHER*	
						Blister Rust						
	Healthy	Misc. Dead	Healthy	Misc. Dead	Healthy	Live	Dead	Misc. Dead	Healthy	Mt. Pine Beetle	Healthy	Misc. Dead
Inches	BASAL AREA (FT^2) PER ACRE											
6			8.9				1.8					
8	8.9	0.9	8.9	0.9		0.9	2.7				4.4	
10	13.3		4.4		4.4				4.4	2.7		
12	8.9		8.9						13.3	0.9		
14	4.4					0.9			8.9		4.4	
16			8.9			0.9		0.9			4.4	
18			4.4			0.9		0.9				
20			4.4									
22								0.9				0.9
24			4.4									0.9
26			4.4									
Total	35.5	0.9	57.6	0.9	4.4	3.6	4.5	2.7	26.6	3.6	13.2	1.8
Percent	98	2	98	2	29	24	30	17	88	12	88	12

*Includes Engelmann spruce, Pacific silver fir, western redcedar, and western hemlock

Table 7C--Incidence (cubic feet per acre) of major diseases and insect damage in Stand 148 by DBH class

STAND 148

DBH Class	GRAND FIR		DOUGLAS-FIR		WHITE PINE				LODGEPOLE PINE		OTHER*	
						Blister Rust						
	Healthy	Misc. Dead	Healthy	Misc. Dead	Healthy	Live	Dead	Misc. Dead	Healthy	Mt. Pine Beetle	Healthy	Misc. Dead
Inches	CUBIC FEET PER ACRE											
6			146.2				23.3		102.6	63.0		
8	214.5	21.9	190.7	19.4		20.0	60.1		351.6	24.5	87.5	
10	363.8		116.7		128.3				251.3			
12	287.5		263.7			27.6					156.1	
14	160.7					29.6					123.9	
16			307.5			30.1		30.1				
18			153.8					50.4				
20			157.2									
22								55.7				43.2
24			190.4									42.1
26			198.0									
Total	1026.5	21.9	1724.2	19.4	128.3	107.3	83.4	136.2	705.5	87.5	367.5	85.3
Percent	98	2	99	1	28	24	18	30	89	11	81	19

*Includes Engelmann spruce, Pacific silver fir, western redcedar, and western hemlock

Table 7D--Incidence (board feet per acre) of major diseases and insect damage in Stand 148 by DBH class

STAND 148

DBH Class	GRAND FIR		DOUGLAS-FIR		WHITE PINE				LODGEPOLE PINE		OTHER*	
						Blister Rust				Mt.		
	Healthy	Misc. Dead	Healthy	Misc. Dead	Healthy	Live	Dead	Misc. Dead	Healthy	Pine Beetle	Healthy	Misc. Dead
Inches	BOARD FEET PER ACRE											
10	1051		248		307				746	52		
12	1162		961			106			914		628	
14	757					136					550	
16			1535			273		273				
18			810					385				
20			878									
22								340				256
24			1154									252
26			1234									
Total	2970	0	6820	0	307	515	0	998	1660	52	1178	508
Percent	100	0	100	0	17	28	0	55	97	3	70	30

*Includes Engelmann spruce, Pacific silver fir, western redcedar, and western hemlock

Table 8A--Incidence (trees per acre) of major diseases and insect damage in Stand 147 by DBH class

STAND 147

DBH Class	GRAND FIR			DOUGLAS-FIR			WHITE PINE			OTHER[1/]	
	Healthy	Indian Paint Fungus	Misc. Dead	Healthy	Dwarf Mistletoe Live	Misc. Dead	Healthy	Blister Rust	Mountain Pine Beetle	Healthy	Misc. Dead
Inches	TREES PER ACRE										
Seedling	1033.0		2.0	55.6		2.0	55.6			66.7	
Sapling	122.2	2.0	59.2	100.0		133.3		33.3		88.9	
6	45.4		8.3								12.5
8	25.5		2.3	12.7		7.0		4.7	4.7	38.2	2.3
10	22.6	3.0	1.0	8.1		1.0	24.4		1.5	8.1	3.0
12	11.3		0.8					1.5	2.1	5.7	
14	16.6	0.8		8.3							
16	6.4	0.6		3.2					0.6		
18	5.0			5.0					0.5		
20				4.1					0.4		
22				6.7							
24	1.4			1.4							
26				2.4				0.2			
28			0.2	2.1		0.2		0.4			
30				1.8	0.2						
32				0.8		0.2					
34								0.1	0.1		
36								0.1			
38					0.1						
40				0.5		0.2		0.1			
42				0.5							
48						0.06					
50					0.06	0.06					
Total*	134.2	4.4	12.6	57.6	0.4	8.7	24.4	7.1	9.9	52.0	17.8
Percent* (within species)	89	3	8	86	1	13	59	17	24	74	26

* Excludes seedlings and saplings

1/ Includes western hemlock, western redcedar, and lodgepole pine

Table 8B--Incidence (basal area per acre) of major diseases and insect damage in Stand 147 by DBH class

STAND 147

DBH Class	GRAND FIR			DOUGLAS-FIR			WHITE PINE			OTHER*	
	Healthy	Indian Paint Fungus	Misc. Dead	Healthy	Dwarf Mistletoe Live	Misc. Dead	Healthy	Blister Rust	Mountain Pine Beetle	Healthy	Misc. Dead
Inches	BASAL AREA (FT^2) PER ACRE										
6	8.9		1.6								2.5
8	8.9		0.8	4.4		2.5		1.6	1.6	13.3	0.8
10	17.8	1.6	0.8	4.4		0.8	13.3		1.6	4.4	1.6
12	8.9		0.8					0.8	1.6	4.4	
14	17.8	0.8		8.9							
16	8.9	0.8		4.4					0.8		
18	8.9			8.9					0.8		
20				8.9					0.8		
22				17.8							
24	4.4			4.4							
26				8.9				0.8			
28			0.8	8.9		0.8		1.6			
30				8.9	0.8						
32				4.4		0.8					
34								0.8	0.8		
36								0.8			
38					0.8						
40				4.4		1.6		0.8			
42				4.4							
48						0.8					
50					0.8	0.8					
Total*	84.5	3.2	4.8	102.0	2.4	8.1	13.3	7.2	8.0	22.1	4.9
Percent* (within species)	91	4	5	91	2	7	47	25	28	82	18

* Includes western hemlock, western redcedar, and lodgepole pine

Table 8C--Incidence (cubic feet per acre) of major diseases and insect damage in Stand 147 by DBH class

STAND 147

DBH Class	GRAND FIR			DOUGLAS-FIR			WHITE PINE			OTHER*	
	Healthy	Indian Paint Fungus	Misc. Dead	Healthy	Dwarf Mistletoe Live	Misc. Dead	Healthy	Blister Rust	Mountain Pine Beetle	Healthy	Misc. Dead
Inches	CUBIC FEET PER ACRE										
6	169.8		31.0								36.3
8	216.2		19.5	95.0		52.4		36.2	36.2	240.8	18.6
10	337.0	44.7	14.9	116.7		14.4	386.5		23.8	104.2	43.2
12	287.5		20.4					34.5	48.3	126.8	
14	635.0	30.6		283.7							
16	340.9	32.0		153.8					25.8		
18	379.8			307.6					36.0		
20				322.2					38.0		
22				749.6							
24	214.8			190.4							
26				396.0				41.4			
28			44.5	402.1		38.3		101.2			
30				385.6	42.8						
32				195.0		48.8					
34								35.0	35.0		
36								38.2			
38					36.4						
40				201.9		80.8		51.4			
42				257.3							
48						34.1					
50					41.9	41.9					
Total*	2581.0	107.3	130.3	4056.9	121.1	310.7	386.5	337.9	243.1	471.8	98.1
Percent* (within species)	92	4	4	90	3	7	40	35	25	83	17

* Includes western hemlock, western redcedar, and lodgepole pine

Table 8D--Incidence (board feet per acre) of major diseases and insect damage in Stand 147 by DBH class

STAND 147

DBH Class	GRAND FIR			DOUGLAS-FIR			WHITE PINE			OTHER*	
	Healthy	Indian Paint Fungus	Misc. Dead	Healthy	Dwarf Mistletoe Live	Misc. Dead	Healthy	Blister Rust	Mountain Pine Beetle	Healthy	Misc. Dead
Inches	BOARD FEET PER ACRE										
10	974	129	43	248		31	924		57	248	92
12	1162		82					133	186	461	
14	2994	144		1258							
16	1167	166		767					234		
18	2119			1620					275		
20				1801					304		
22				4428							
24	1341			1154							
26				2468				346			
28			290	2552		243		792			
30				2472	275						
32				1266		317					
34								272	272		
36								297			
38					245						
40				1367		547		387			
42				1790							
48						294					
50					295	295					
Total*	9757	439	415	23191	815	1727	924	2227	1328	709	92
Percent* (within species)	92	4	4	90	3	7	21	50	29	89	11

* Includes western hemlock, western redcedar, and lodgepole pine

Table 9A--Incidence (trees per acre) of major diseases and insect damage in Stand 146 by DBH class

STAND 146

DBH Class	GRAND FIR			DOUGLAS-FIR			PONDEROSA PINE		OTHER[1/]	
	Healthy	Root Rot Dead	Misc. Dead	Healthy	Dwarf Mistletoe Live	Misc. Dead	Healthy	Misc. Dead	Healthy	Misc. Dead
Inches	TREES PER ACRE									
Seedling	253.8		5.3	15.4			7.7		7.7	
Sapling	192.3		28.0	46.2		1.3			7.7	2.7
6	109.9	1.4	5.4	54.9		8.2		1.4		
8	22.0		1.5	4.4	0.8	0.8				0.8
10	11.3			14.1			5.6	0.5		
12	2.0	0.3		7.8	0.7			0.3	2.0	
14	1.4			1.4						
16				2.2		0.2				
18	1.7	0.2								
20	0.7			1.4						
22	0.6			0.6	0.1					
24	0.5			2.5				0.08		
26				1.3			0.4			
28			0.06		0.2		0.7			
30							0.3			
32							0.3			
34								0.04		
Total*	150.1	1.9	7.0	90.6	1.8	9.2	7.3	2.3	2.0	0.8
Percent* (within species)	95	1	4	89	2	9	76	24	71	29

* Excludes seedlings and saplings

1/ Includes lodgepole and white pine

Table 9B--Incidence (basal area per acre) of major diseases and insect damage in Stand 146 by DBH class

STAND 146

DBH Class	GRAND FIR			DOUGLAS-FIR			PONDEROSA PINE		OTHER*	
	Healthy	Root Rot Dead	Misc. Dead	Healthy	Dwarf Mistletoe Live	Misc. Dead	Healthy	Misc. Dead	Healthy	Misc. Dead
Inches	BASAL AREA (FT^2) PER ACRE									
6	21.6	0.3	6.5	10.8		1.6				
8	7.7		0.5	1.5	0.3	0.3				0.3
10	6.7			7.7			3.1	0.3		
12	1.5	0.3		6.2	0.5				1.5	
14	1.5			1.5				0.3		
16				3.1				0.3		
18	3.1	0.3				0.3				
20	1.5			3.1						
22	1.5			1.5	0.3					
24	1.5			7.7				0.3		
26				4.6			1.5			
28			0.3		0.8		3.1			
30							1.5			
32							1.5			
34								0.3		
Total*	46.6	0.9	7.3	47.7	1.9	2.2	10.7	1.5	1.5	0.3
Percent* (within species)	85	2	13	92	4	4	88	12	83	17

* Includes lodgepole and white pine

Table 9C--Incidence (cubic feet per acre) of major diseases and insect damage in Stand 146 by DBH class

STAND 146

DBH Class	GRAND FIR			DOUGLAS-FIR			PONDEROSA PINE		OTHER*	
	Healthy	Root Rot Dead	Misc. Dead	Healthy	Dwarf Mistletoe Live	Misc. Dead	Healthy	Misc. Dead	Healthy	Misc. Dead
Inches	CUBIC FEET PER ACRE									
6	411.0	5.2	20.2	176.8		26.4		4.3		
8	186.6		12.7	32.9	6.0	6.0				6.5
10	168.5			203.2			87.0	7.8		
12	50.9	7.6		182.1	16.3			7.2	46.0	
14	53.6			47.9						
16				105.7		9.6				
18	129.1	15.2								
20	64.8			110.0						
22	76.3			67.1	11.2					
24	76.7			340.0				11.2		
26				214.5			74.4			
28			13.4		38.3		149.2			
30							66.7			
32							87.6			
34								11.1		
Total	1217.5	28.0	46.3	1480.2	71.8	42.0	464.9	41.6	46.0	6.5
Percent (within species)	94	2	4	93	5	2	92	8	88	12

* Includes lodgepole and white pine

Table 9D--Incidence (board feet per acre) of major diseases and insect damage in Stand 146 by DBH class

STAND 146

DBH Class	GRAND FIR			DOUGLAS-FIR			PONDEROSA PINE		OTHER*	
	Healthy	Root Rot Dead	Misc. Dead	Healthy	Dwarf Mistletoe Live	Misc. Dead	Healthy	Misc. Dead	Healthy	Misc. Dead
Inches	BOARD FEET PER ACRE									
10	487			431			211	19		
12	206	31		663	60			28	177	
14	252			212						
16				527		48				
18	720	85								
20	374			615						
22	463			397	66					
24	479			2061				69		
26				1137			472			
28			87		243		961			
30							432			
32							585			
34								73		
Total	2981	116	87	6043	369	48	2661	189	177	0
Percent (within species)	94	4	2	93	6	1	93	7	100	0

* Includes lodgepole and white pine